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ATTACHMENT 1

**LOWRY COALITION AND CITIZENS AGAINST LOWRY LANDFILL
COMMENTS ON INITIAL DATA EVALUATION REPORT (APRIL, 1991)**

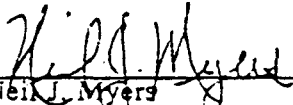
A Report Prepared for

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TECHNICAL REVIEW OF DRAFT
INITIAL DATA EVALUATION REPORT
LOWRY LANDFILL: LANDFILL SOLIDS
AND LANDFILL GAS OPERABLE UNITS
REMEDIAL INVESTIGATION AND
FEASIBILITY STUDY
ARAPAHOE COUNTY, COLORADO

HLA Job No. 18876,098.10

by



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1.0 GENERAL COMMENTS

Harding Lawson Associates (HLA) has reviewed the draft Initial Data Evaluation (IDE) Report, Lowry Landfill: Landfill Solids and Landfill Gas Operable Units Remedial Investigation and Feasibility Study (OU RI/FS), Arapahoe County, Colorado. The general comments regarding this document are as follows:

1. The data needs identified in this report are inadequate and are based on the assumption that most data needs can be fulfilled by data from other sources without regard as to whether such data is representative of the Lowry Landfill site.
2. This report presents a limited evaluation of the landfill solids and landfill gas with respect to the contaminant contributions from these media. This limited evaluation is, in part, due to a lack of data. The authors have made several generalizing assumptions that preclude the need for further data. The majority of these assumptions are not substantiated. All conclusions and assumptions must be supported by either site-specific data or relevant references.
3. This report relies heavily on data from the literature and data from other sites. The use of literature data and data from other sites are only appropriate where it can be shown that these data are representative of data from the Lowry Landfill site. A determination of representativeness must consider the site conditions, and the timing and nature of past disposal practices at Lowry compared to the site conditions and disposal practices of sites referenced in the literature. In most cases site-specific data are not available to support the assertion that these non-site-specific sources are representative. If the use of such outside data sources cannot be supported, then a need for additional site-specific data exists.
4. Data from the County Line Landfill are presented as being representative of data from the Lowry Landfill site. Data to support this comparison does not exist. In addition, most of the waste at County Line Landfill was placed substantially later than the waste at Lowry Landfill, meaning the time frames of disposal and refuse age are significantly different. Environmental regulations have banned the use of many hazardous chemicals and their disposal in municipal landfills since 1980 and the character of municipal refuse may also change. In addition, the codisposal practices used at Lowry Landfill may have contributed to the increased mobility of hazardous constituents contained in the municipal refuse. These two landfills cannot be represented as comparable without data to support such a comparison.
5. Many of the approaches and conclusions presented in this report are based on recently released U.S. Environmental Protection Agency (EPA) guidance documents especially on EPA guidance for Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) municipal landfill sites. Comparison of the Lowry Landfill site to other municipal landfill sites is not appropriate. In addition, these OUs are being conducted under an administrative order (AO). In some cases, the requirements of this AO have been ignored presumably on the basis that they are superseded by more recent EPA guidance. The evaluations conducted for these OUs must comply with all requirements of the AO.

6. In many cases, this document uses the data from media in other OUs as representative of data for the media in the landfill solids and landfill gas OUs (OUs 2 and 3). Such a representation cannot be made unless it is supported by site-specific data from the media in these OUs.
7. The evaluations and conclusions presented in this report assume that the only need for data from the media in OUs 2 and 3 are to support the endangerment assessment (EA) and FS for these OUs. However, data regarding contaminants contributed by media in OUs 2 and 3 to media in other OUs are also needed to complete the FS for other OUs. Site-specific data needs necessary to evaluate media interactions must also be considered.

2.0 SPECIFIC COMMENTS

Cover Letter, Paragraph 3:

In the cover letter for the IDE Report, Waste Management of Colorado, Inc., and the City and County of Denver (Respondents) state that

"The IDE also reflects the approach taken in the National Contingency Plan (NCP) (55 Federal Register 8666, March 8, 1990) and EPA's guidance "Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites" (OSWER Directive 9355.3-11, February 1991). These two documents promote streamlining of the RI/FS process and selection of a remedy via focusing the RI/FS tasks on data required to evaluate alternatives that are most practicable for municipal landfill sites."

The referenced documents do not override the requirements of the AO for OUs 2 and 3. The Respondents must conduct all evaluations required by the AO and collect any additional site characterization (ASC) data identified as data needs in support of the comprehensive data evaluations required by the AO.

Section 1.0, Page 1-1, Paragraph 2:

In the next to the last sentence of this paragraph, the Respondents discuss the media that are the focus of the landfill gas and landfill solids OUs (OUs 2 and 3). In addition, to the media mentioned in this paragraph, buried tires are also included in the media covered under Exhibit A (Conceptual Work Plan) to the AO for the landfill solids OU.

Section 2.0, Page 2-1, Paragraph 2:

In this paragraph, the Respondents indicate that only limited data are available specific to unsaturated landfill solids, leachate within the unsaturated zone, and landfill gas. They also indicate that to aid in the various preliminary evaluations

"...appropriate literature sources were identified to augment the site-specific information. Many of the media interaction evaluations detailed in Section 5.0 include data from non-site-specific literature sources. This approach was used to evaluate conceptual model sensitivity of the various media and interactions with respect to the overall goals of supporting the RI report completion EA and FS."

It is acceptable to use literature sources to augment data for purposes of the IDE evaluations, but literature sources must not be used as a substitute for site-specific sources in support of the evaluations to be performed for the Comprehensive Data Evaluation (CDE). Therefore, the lack of non-site-specific data for unsaturated landfill solids, leachate within the unsaturated zone, and landfill gas constitutes data needs that must be fulfilled as a part of the ASC program for OUs 2 and 3.

Section 2.0, Page 2-1, Paragraph 3:

The first sentence of this paragraph states that

"This section summarizes the available site-specific data (chemical and physical) which may be of use in completing the RI/FS and EA for OUs 2 and 3."

This statement is inaccurate because this section also includes documents that provide non-site-specific data. As stated above, non-site-specific data may be used to augment site-specific data, but not as a substitute for it. All non-site-specific data sources included in Table 2-1 should be clearly designated as such, and, if they are used in the evaluations described in this IDE Report, they should be included in their entirety as appendixes to this report to provide reviewers with the background information necessary to conduct a thorough review.

Section 2.1, Page 2-5,

This section summarizes the data available for solids and leachate. A location map should be provided to identify the locations of the data points and allow a review of the adequacy of the areal extent of the data. In addition, this summary does not list a category for leachate data. This implies that no site-specific leachate data exists and that, in order to perform the evaluations specified in the Conceptual Work Plan (CWP) for the CDE, such data must be obtained during the ASC program. It should also be noted that wells U702 and U703 were designated as refuse wells by EPA. Therefore, liquids from these wells should be representative of landfill leachate. A discussion of the liquid data from these wells should be addressed under the leachate category.

Section 2.1, Pages 2-6 through 2-10, Table 2-2:

This table provides a summary of solids samples, analytical parameters, and sample locations. In the P/H column for stations WP102-7, WP102-9, and WP102-14, footnote number 6 is referenced, but is not provided. In addition, footnote "a" indicates that depth intervals are provided for composite samples, yet no depth intervals are given for several of the waste-pit solid composite samples.

Section 2.1, Page 2-23, Paragraph 2:

The second bullet of this paragraph states that

"The 'alluvium' classification indicates samples collected from either Quaternary surficial deposits or lower Dawson Formation deposits."

Lower Dawson Formation deposits should not be included with alluvial deposits, but should have a separate designation.

Section 2.1, Page 2-23, Paragraph 3:

In this paragraph, the Respondents state that

"No site-specific leachate data from the unsaturated zone are available. In absence of these data, leachate characteristics are assumed indirectly from waste-pit liquid samples and leachate data from a comparable landfill."

As mentioned previously, EPA's refuse wells U702 and U703 were meant to be representative of refuse leachate. The Respondents should address the use of data from these wells to fulfill leachate data needs. Use of leachate data from a "comparable landfill", if available, is acceptable for use in conducting evaluations for the IDE, but must not be used as a substitute for site-specific data during the CDE. The Lowry Coalition does not necessarily accept data from County Line Landfill as being comparable to Lowry Landfill. These two landfills were operated at different times under different regulatory conditions. As a result, the nature of the refuse disposed of at these two sites and the disposal practices employed are potentially quite different. If no site-specific leachate data is available, it constitutes a data need that must be obtained during the ASC program for these OUs.

Section 3.1, Page 3-1, Paragraph 3:

In the first bullet of this paragraph, ASC data generated by HLA in 1991 is referenced. HLA has submitted several sets of ASC data to EPA in 1991. This reference must be more specific to allow the content of the data being reviewed to be determined.

Section 3.1.1, Pages 3-5, Paragraph Continued on Page 3-6:

This paragraph provides bulleted evaluation summaries of each type of data reviewed. The source of the data must be identified in each bullet (e.g., EPA Phase I or II, HLA ASC, etc.).

Section 3.1.1, Page 3-6, First and Last Bullets:

These bullets address the quality of the available toxicity characteristic leaching procedure (TCLP) data for solid samples. The Respondents indicate that these data are either unusable or useable only to evaluate trends or support conclusions on the basis of other nonqualified data. The lack of nonqualified site-specific data constitutes a data need. These data must be obtained during the ASC program for these OUs.

Section 3.1.1, Page 3-7, Bullet 1:

This bullet indicates that nonqualified site-specific extraction procedure (EP) toxicity data are not available. Therefore, as stated in the previous comment, the lack of these data constitute a data need that must be obtained during the ASC program for these OUs.

Section 3.1.1, Page 3-7, Bullet 2:

This bullet indicates that target compound data for EPA liquid samples from WP-series wells can be used only to evaluate trends or support conclusions on the basis of other nonqualified data. It should be noted that another round of waste-pit liquid data has been collected under the ASC program for OUs 1 and 6. These data will provide lower detection limits and, therefore, should be used instead of the EPA data. They should fulfill any data needs associated with this item.

Section 3.2.1.1, Page 3-11, First Full Paragraph:

This paragraph indicates that soil-water potential data collected from psychrometers installed by EPA

"...is not usable for the intended purpose of supporting a quantitative water balance for the Lowry Landfill."

If other site-specific data are not sufficient to fulfill this purpose, the lack of these data will constitute a data need that must be fulfilled during the ASC program for these OUs.

Section 3.1.2.1, Page 3-12, First Full Paragraph:

In this paragraph, the Respondents indicate that soil moisture content data collected by EPA from neutron probes was not usable. If other sufficient site-specific moisture content data are not available, the lack of these data will constitute a data need that must be obtained during the ASC program for these OUs.

Section 3.2.2, Page 3-12, Last Paragraph Continued on Page 3-13:

In this paragraph, the Respondents reference averaging techniques for rainfall. References should be provided for each of these methods.

Section 3.2.3, Page 3-13, First Full Paragraph:

In this paragraph, the Respondents reference precipitation data from the Cherry Creek Dam. A reference for these data should be provided and the data should be included with this report as an Appendix.

Section 3.2.3, Page 3-13, Second Full Paragraph:

In this paragraph, the Respondents state that

"to fulfill requirements of the CWP for the OUs 2 and 3, an evaluation must be made of the contribution of landfill leachate to shallow groundwater."

A satisfactory evaluation of leachate contribution was not done in this IDE Report and the Respondents did not identify the need for any additional data for this purpose. Therefore, the Respondents have not fulfilled the requirements of the CWP for OUs 2 and 3.

This paragraph also states that the evaluation of waste-pit bottom and waste-pit liquid elevations done as a part of the IDE for OUs 1 and 6 was not of sufficient detail for use in OUs 2 and 3 evaluations. An evaluation of the waste-pit bottom and waste-pit liquid elevations was conducted as a part of the IDE for OUs 1 and 6. This evaluation included both an evaluation of all EPA Phase I and II waste-pit information and an evaluation of more historical photographs than were evaluated by OUs 2 and 3. In addition, the results of this evaluation were approved by EPA.

Section 3.2.3, Page 3-14, First Full Paragraph:

In this paragraph, the Respondents state that

"The photo interpretations also verify that individual pits may have been filled with refuse and subsequently re-excavated to depths greater than the initial pit."

This situation seems very unlikely. Operators would have had to excavate saturated refuse and would have had to either stockpile this excavated refuse and use it to refill the pits or landfill it in a different area. The complete results of the photographic interpretations must be presented as a part of this IDE Report to substantiate this statement.

Section 3.2.3, Page 3-14, Last Paragraph:

In this paragraph, the Respondents state that

"The approximate waste-pit base elevations and liquid elevations (error margin of approximately ± 10 feet) along with well screened interval elevations are summarized on Table 3-2."

The margin of error is much greater than stated because a significant period of time elapsed between aerial photographs. Therefore, pits could have been excavated to greater depths or pits could even have been totally excavated and filled between subsequent aerial photographic events. A significant amount of additional liquids could also have been added to pits between photo-

graphic events. Therefore, waste-pit base and pit-liquid elevations could have varied significantly from those listed in Table 3-2. Several other factors regarding Table 3-2 should also be noted. The liquid levels for well points WP710, WP712, and WP713 were identified as being higher in the IDE Report for OUs 1 and 6. Therefore, identification of these well points as refuse wells is arbitrary. The waste-pit base in Table 3-2 is shown as being higher than the waste-pit liquid level for waste-pit well point WP707 and well U705. This is not possible. This inconsistency should be clarified.

Section 3.2.2, Page 3-16, Paragraph 1:

In this paragraph, the Respondents indicate that waste-pit well points WP709, WP710, WP712, and WP713

"... have been identified as probably being screened within refuse or outside waste-pit boundaries."

Because of gaps in the time frames between aerial photographs, it is impossible to make such a precise determination. In addition, the results presented in the IDE Report for OUs 1 and 6 for the waste pit in which well point WP710 is installed were given on the basis of an aerial photograph from April 1978, which was not evaluated by the Respondents. Therefore, The Lowry Coalition believes that monitoring results for these four waste-pit well points are representative of the waste-pit liquids.

Section 3.2.4, Page 3-16, Paragraph 2:

In this paragraph, the Respondents reference a gas recovery test program conducted by Waste Management of North America (WMNA) in 1986 and a summary report issued in 1987. The WMNA report should be included as an appendix to the IDE Report. The evaluations conducted and conclusion made in this report cannot be fully evaluated without this information.

Section 3.2.4, Page 3-17, Last Paragraph:

The accuracy of statements made in this paragraph regarding calibration, qualified personnel, and the quality of the data cannot be evaluated without a review of the WMNA report. As stated in the previous comment, this report should be included as an appendix.

Section 4.0, Page 4-1, Paragraph 2:

In this paragraph, the Respondents make the following statement:

"The data needs are focused toward completing the EA and evaluating engineering alternatives during the FS."

The words "as required by the AO for these OUs" should be added at the end of this sentence.

A bullet should be added to this paragraph addressing site-specific media interactions and the required data quality objectives (DQOs). At a minimum, level III data will be required to evaluate media interactions because the results of this data evaluation will be used in the FS for OUs 2 and 3, and OUs 1 and 6. As a part of the IDE evaluations for media interactions, the Respondents used County Line Landfill and the Denver-Arapahoe Chemical Waste Processing Facility (DACWPF) data. The analytical level of these data is not provided. Unless the analytical level of these data is at least level III, these data cannot be used in the CDE evaluations for media interactions used to support the FS. However, even if these data are level III or higher, they cannot be considered as level III for the Lowry Landfill site because their representativeness cannot be established.

Section 4.0, Page 4-2, First Full Paragraph:

This paragraph references four activities for which data are required for OUs 2 and 3. This number should be changed to five and "assessment of media interactions" should be added to this list.

Section 4.0, Page 4-3, Table 4-1:

This table discusses analytical levels required for each type of activity being conducted for OUs 2 and 3. If literature sources are used to fulfill data needs, these literature sources must meet the specified analytical level for the activity for which it is being used. The Respondents must provide a discussion of the analytical level of all literature data including supporting documentation sufficient to confirm that the required analytical level has been meant.

Section 4.0, Pages 4-4 through 4-19, Tables 4-2 and 4-3:

These tables do not provide a discussion of the analytical level for data from "Appropriate Other Data Sources". Such a discussion and the supporting documentation to confirm this assessment must be provided. In most cases, the other data sources are listed simply as literature sources. Specific data to be used from the literature must be listed and accompanied by a reference. If the literature data are used in evaluations conducted as a part of this report, the data must be provided as an appendix to this report.

Section 4.0, Page 4-9, Table 4-2:

Under radionuclides, only Radium 226, Radium 228, Gamma Radiation, and Radon decay products are identified as potential data needs. Liquid and solid sampling conducted under OUs 1 and 6 have identified the presence of several specific radioisotopes. Because these radioisotopes have been detected and are known to be present in both the solids and liquids in OU 1 and 6 media, they must also be listed as potential data needs for OU 2 and 3 media.

Section 5.1.2, Page 5-5, Paragraph 4:

The last sentence of this paragraph states that

"A determination of the existence of the Preble's jumping mouse is to be made as part of the RI/FS for OUs 1 and 6."

This statement is inaccurate. An evaluation of the existence of Preble's jumping mouse is not being made as part of the RI/FS for OUs 1 and 6. A determination of the existence of the Preble's jumping mouse is most appropriately made as a part of the OU encompassing the media

in which its habitat exists. Therefore, this determination should be made either under the landfill solids OU or the soil and sediments OU.

Section 5.1.2, Page 5-5, Last Paragraph Continued on Page 5-6:

This paragraph addresses the possibility that black-footed ferrets and bald eagles may be present in the project area. This suggests that there is a need for a field survey to evaluate the whether or not these species are present. Any field evaluation conducted for this purpose should be done under OUs 2 and 3 or OUs 4 and 5 because these species are not present in media covered under OUs 1 and 6.

Section 5.2.1, Page 5-8, Fourth Full Paragraph

This paragraph discusses cap materials placed over the landfill area. An evaluation of the summary reports by Golder Associates regarding quality assurance inspection of clay cover construction at the Denver-Arapahoe Disposal site (Golder Associates, 1988, 1989, and 1990) was reviewed by HLA. This review indicated that the cover material was classified as a clay and that this material exceeded the permeability criteria of 10^{-6} centimeters per second (cm/sec) and the relative compaction criteria of 90 percent. However, the plasticity index ranged from 28 to 33 percent and the average liquid limit ranged from 49 to 53 percent. Soil having liquid limits greater than 40 percent and plasticity indices greater than 20 percent are generally classified as potentially expansive. Therefore, when the cover material is exposed to changes in moisture content, it will experience swelling and desiccation. Such changes will very likely result in desiccation cracks that significantly decrease the effectiveness of the cover material with regard to its ability to minimize infiltration. For this reason, the cover material cannot be considered equivalent to a 4-foot clay cap. The thickness of the cap must be reduced by the depth of the desiccation cracks when used in consideration of any water balance calculations. These expansive properties will also increase the erodibility of the cover material.

Section 5.2.3.1, Page 5-13, Paragraph 3:

This paragraph states that the available site-specific infiltration, evaporation, and precipitation data are not adequate for infiltration assessment. Evaporation and precipitation data from nearby stations may be adequate for this purpose if it can be shown that these data are comparable to the Lowry Landfill site. However, site-specific infiltration data will be needed to complete this assessment.

Section 5.2.3.1, Page 5-14, Paragraph Continued from Page 5-13:

In this paragraph, the Respondents state that

"Additional data on subsurface soils physical characteristics and permeability is being generated as part of the OUs 1 and 6 RI/FS."

This statement is correct. However, these data are being generated only for saturated subsurface soil and, therefore, are not applicable to the unsaturated media covered by OUs 2 and 3.

Section 5.2.7.2, Page 5-20, Paragraph 2:

This paragraph states that

"Additional human population characterization may occur for the OUs 1 and 6 EA."

The human population data presented in the IDE Report for OUs 1 and 6 will be updated to incorporate the results of the 1990 census, but no further work will be done.

Section 5.3, Page 5-22, Last Paragraph Continued on Page 5-23:

In this paragraph, it is stated that "Solid samples from within the saturated zone were also included for purposes of comparison and interaction assessment." Data for samples from the unsaturated zone are generally not available. Therefore, no comparison can be made between data for the saturated zone and data for the unsaturated zone. It is appropriate to include data from the saturated zone for purposes of evaluating interactions; however, these data should not be

included as representative of contamination in the unsaturated zone without a comparison to data from the unsaturated zone to support such a representation.

Section 5.3.1.1, Page 5-23, Last Paragraph:

This paragraph and Tables 5-1 discuss the subsurface solids sample data available for the landfill solids OU. This paragraph is confusing, making it unclear which of the referenced samples are being utilized for evaluation of the subsurface solids in OU 2. The majority of the samples listed in Table 5-1 are from other media and, therefore, should not be used in the evaluation of subsurface solids for OU 2. The sample data being used for evaluation of OU 2 subsurface solids should be specifically designated, and the distribution and location of these samples within the OU boundaries (both laterally and vertically) should be provided.

In this paragraph, the Respondents state that only one refuse solid sample was collected from the unsaturated zone. This refuse sample was not analyzed for chemical parameters. Therefore, no chemical data are available from the unsaturated zone. A total lack of chemical data definitely constitutes a data need that must be obtained during the ASC program for these OUs.

Section 5.3.1.1, Page 5-26, Paragraph 1:

In this paragraph the Respondents state that

"It is understood that the approach taken by CH2M Hill was to collect samples only from areas of suspected contamination. If contamination was suspected, either from visual observations and/or field instrumentation monitoring, it is expected that samples would have been collected and analyzed from the unsaturated zone."

A specific reference for the statement regarding CH2M Hill's sample collection approach must be provided and documentation that this approach was followed must also be provided. However, a sampling approach, based on an assumption that contamination does not exist if samples were not taken, is not valid. Such a conclusion must be supported by analytical data indicating that contamination is not present.

Section 5.3.1.1, Page 5-26, Paragraph 2:

In this paragraph, the Respondents reference Table 5-3, which

"...lists all Phase I and II RI/FS chemical analytes either detected in subsurface solids samples, waste-pit liquid, or landfill gases or considered to be potential associated compounds or transformation precursors."

In addition, they indicate that

"The frequency of occurrence was calculated by dividing the number of detections of an analyte by the number of times for which it was analyzed."

It is unclear why data from other OUs (e.g. waste-pit liquids) are included as analytes present in OUs 2. The Respondents are using data from the entire site in their evaluation of the contamination in the landfill solids media. These data are not representative of the actual contamination present in OU 2 media.

Section 5.3.1.1, Page 5-26, Last Paragraph Continued on Page 5-32:

In this paragraph, the Respondents state that

"The statistical plots demonstrated that while some contaminants are normally distributed across the site, most are not. Statistical calculations of median, mean, standard deviation and co-variance are not appropriate to data sets that are not normally distributed."

It appears as though transformations of these data sets were not investigated. It is well documented that geochemical data are generally log-normally distributed.

Section 5.3.1.1, Page 5-27, Table 5-3:

This table provides a summary of the frequency of detection, carcinogenicity or toxicity, toxicity rating, and relative mobility. Comments on this table include the following:

1. For the purpose of rating toxicity, a consistent route of exposure should be used; e.g., all oral instead of mixing inhalation and oral.
2. A brief check indicates that some of the toxicity factors are incorrect or out of date; e.g., 1,2-dichloroethene and carbon tetrachloride.
3. Most importantly, Reference Doses (RfDs) and slope factors should not be used on an equivalent basis. The former is essentially a daily intake, in milligrams per kilogram per day (mg/kg/d) while the latter is a slope (mg/kg/d⁻¹). To place the slope factor information on an equivalent basis, a risk level should be selected (such as 1 x 10⁻⁶) and divided by the slope factor. For example, vinyl chloride becomes:

$$\frac{10^{-6}}{1.9 \text{ oral mg/kg/d}^{-1}} = 5.26 \times 10^{-7} \text{ mg/kg/d}$$

This number may be used as a comparison in Table 5-3. Because of the previous comments referring to this table, the current listing of relative toxicity ratings is meaningless.

This table also references the revised Applicable or Relevant and Appropriate Requirements (ARARs) Evaluation for OUs 2 and 3. This document has never been released to Technical Advisory Group (TAG). If it is to be referenced as a source in this IDE Report, it must be available to TAG for review.

Section 5.3.1.1, Page 5-32, First Full Paragraph:

This paragraph discusses the selection of compounds of concern (COCs). The first sentence of this paragraph states that

"Tables 5-7 and 5-8 list the compounds of concern (COCs) for the solids samples based on evaluation of Tables 5-3 through 5-6."

Yet the title of Table 5-4 indicates that it summarizes COCs. This inconsistency should be clarified.

In the second bullet of this paragraph, the Respondents state

"Pesticides, PCBs, and dioxins are not included as COCs due to a combination of low frequency of detection and low mobility."

Dioxins have a very high toxicity. In addition, dioxins were detected in refuse wells U702 and U703. During the ASC sampling for OUs 1 and 6, dioxins were detected in groundwater and waste-pit liquid samples. Therefore, even though dioxins have a low mobility, they should be retained as a COC because of toxicity, frequency of detection factors, and presence in liquid samples.

In the third bullet of this paragraph, the Respondents indicate that

"Many frequently detected and relatively mobile inorganic analytes are not included as COCs due to their concentrations being essentially equivalent to those expected for background soils (see Table 5-6), or because they are not toxic."

It is not appropriate to use an average of the entire western United States as representative of background for the Lowry Landfill site. An evaluation of all data from the site area should be conducted to determine if local background data can be established.

Section 5.3.1.1, Page 5-32, Second Full Paragraph:

In this paragraph, the Respondents indicate that

"Compounds with greater than 10 percent frequency of detection were considered as possible COCs."

Given the limited number of samples, it is not appropriate to use a 10 percent cutoff or to develop COCs at this time.

In this paragraph, the Respondents also indicate that naphthalene was used as a COC instead of phenanthrene because it has a higher mobility. However, phenanthrene has a higher carcinogenicity than naphthalene.

Section 5.3.1.1, Page 5-33, Table 5-4:

This table indicates that a total of 69 samples were used in this analysis. However, Table 5-2 indicates that there were a total of 81 solid samples analyzed of which 57 were saturated alluvium, 7 were saturated refuse, and 2 were saturated mixed matrices. The number of solids samples in Table 5-4 should be consistent with the numbers provided in Table 5-2.

Section 5.3.1.1, Page 5-34, Table 5-5:

This table provides a summary of concentration range by analyte of metals and radionuclides. Several specific radioisotopes were detected in groundwater, waste-pit liquid, and solids samples collected from OUs 1 and 6. These specific radioisotopes should also be listed in this table and considered for inclusion as COCs because some of these radioisotopes, such as Plutonium 241, are highly toxic.

Section 5.3.1.1, Page 5-35, Table 5-6:

This table provides mean concentrations in the western United States of select chemicals. It is not appropriate to use an average of values from one half the United States as representative of background for the Lowry Landfill site. Background values should be given on the basis of local values to the maximum extent possible. It should also be noted that the reference for this table is not included in the list of references for the IDE Report.

Section 5.3.1.1, Page 5-36, Table 5-7:

This table summarizes preliminary COCs for OUs 2 and 3. The Lowry Coalition does not agree with this selection of COCs. Several compounds that are either highly toxic, mobile, and/or frequently detected have not been included in this list. Examples include vinyl chloride, dioxin, and polychlorinated biphenyls (PCBs).

Section 5.3.1.2, Page 5-38, First Full Paragraph:

This paragraph should provide a summary of the surface soil data within OU 2 that are available for evaluation including the location and distribution of these samples.

Section 5.3.2.1, Pages 5-38 and 5-40:

With regard to subsurface solids, the Respondents state that

"All of the subsurface solids samples for which chemical analysis are available are from the saturated zone. ...These analytes are presented as representative of distributions of similar analytes in solid samples."

Data from saturated subsurface solids samples cannot be presented as representative of distributions of similar analytes in unsaturated solid samples unless data from unsaturated subsurface solids samples are available to substantiate this representation. There is obviously a need for additional data from the unsaturated subsurface solids. The approach presented here has no scientific basis and appears to be an attempt to avoid additional field work. Saturated solids data are not representative of unsaturated solids data just because the Respondents say they are. This assertion must be substantiated.

Section 5.3.2.1, Page 5-40, Last Paragraph Continued on Page 5-47:

In this paragraph, the Respondents state that waste-pit liquid samples generally exhibit the most frequent number of detections and the highest concentrations for a particular COC. This is not true. Toluene, 1,1,1-trichloroethane, phenol, and phthalates were detected at higher concentrations in solid samples. In addition, this conclusion is given on the basis of a sample data

set that is biased towards waste-pit liquids, considering the lack of data from the unsaturated landfill solids.

Section 5.3.2.1, Page 5-47, First Full Paragraph:

In this paragraph, the Respondents give general observations regarding specific analyte groups. These trends are based almost solely on data from saturated refuse and waste-pit solid samples that are not part of OU 2. Sufficient data for unsaturated solid samples are not available for comparison to assess whether or not the contamination detected in the saturated subsurface solids are representative of the contamination in the unsaturated subsurface solids.

Section 5.3.2.1, Page 5-47, Second Full Paragraph:

In this paragraph, the Respondents state that

"sufficient analytical data exist for subsurface solids with the exception of the reported medical waste disposal area in the southeast part of the landfill, and in the tire pile area north of the landfill."

This conclusion is based solely on data from saturated subsurface solids and waste-pit liquids, which may not be representative of the contamination in the unsaturated subsurface solids. There is a definite data need for additional unsaturated subsurface solids data within the landfill area.

Section 5.3.2.2, Page 5-48, Figure 5-8:

This figure indicates that there are background surface soil sample locations within the sewer sludge/leachate injection area. This soil is not representative of background. It appears that the symbols for background surface soil sample locations and sewage sludge/leachate area surface soil sample locations may have been switched because there was no sewage sludge/leachate injection in the southwest corner of the site.

Section 5.3.2.2, Page 5-49, Third Full Paragraph:

In this paragraph, the Respondents state that

"Though the other surface soil sample locations within the tire pile area were considered to be within a leachate spraying area in EPA Technical Memorandum No. 5 (EPA, 1989b), no significant detections occurred."

The Respondents must define what constitutes "significant detections."

Section 5.4.1, Page 5-53, Paragraph 1:

In this paragraph, the Respondents state that

"As required in the CWP and the Final IDE Work Plan for OUs 2 and 3, the nature and extent of leachate contamination within unsaturated landfill solids was addressed by determining the potential for perched leachate and identifying existing chemical data for perched fluids."

The CWP requires that the nature and extent of leachate contamination within the unsaturated landfill solids be assessed. Perched liquid and perched leachate are not the only leachate within the unsaturated landfill solids. For example, infiltration moves through the unsaturated zone even though conditions are not saturated. Moisture (other than perched liquids) moving through the unsaturated zone must also be characterized. Therefore, even though perched liquids were not identified, there still exists a data need for leachate characteristics.

Section 5.4.1, Page 5-54, First Full Paragraph:

The Lowry Coalition agrees with the conclusions made in this paragraph. There currently is no data available for leachate from the unsaturated refuse. Therefore, this constitutes a data need that must be fulfilled in the ASC program for OUs 2 and 3.

Section 5.4.2, Page 5-55, First Full Paragraph:

In this paragraph, the Respondents present an alternate approach to evaluating the nature and extent of leachate contamination at the Lowry Landfill site because of the lack of site-specific data on leachate composition. This alternate approach involves comparing leachate chemistry for the County Line Landfill and Denver Arapahoe Chemical Waste Processing Facility (DACWPF) to the combined leachate/waste-pit liquid chemistry at Lowry Landfill in attempt to determine the impact of refuse leachate. This comparison is inappropriate for several reasons.

Both County Line Landfill and DACWPF were active substantially later than the Lowry Landfill site. This means that the age of refuse and the contents at County Line Landfill may be substantially different than most of the refuse at Lowry Landfill. In addition, different generators and, therefore, different materials may have been disposed of at DACWPF than at Lowry Landfill. Different operating practices were also used DACWPF. For these reasons, these facilities are not comparable to the Lowry Landfill site.

Only a one page summary of the data from County Line Landfill and DACWPF was provided in support of this alternative analysis. All relevant reports and data from both sites must be provided as an appendix to this report so that a thorough evaluation of these two sites can be made by reviewers.

Section 5.4.2, Page 5-57, Table 5-10:

According to this table, several of the compounds used as discriminators were not obtained or analyzed for in the force main collector (FMAIN). For example, Table 5-10 indicates that the FMAIN was not analyzed for 1,1,1-trichloroethene, 1,1-dichloroethane, 1,2-dichloroethane, or chloroform. Data from this location would probably constitute the most accurate characterization of the leachate from County Line Landfill.

Section 5.4.2, Page 5-56, Last Paragraph Continued on Page 5-58:

This paragraph references the data provide in Table 5-10 and identifies 7 compounds that are described as "discriminators" between the impacts of refuse leachate and hazardous waste liquids. These discriminator compounds were developed from data from the MW series wells at the County Line Landfill site. These wells are located at the perimeter of the site and, therefore, are representative of groundwater impacted by landfill leachate not of the leachate itself. In addition, many of these discriminator compounds were detected at both County Line Landfill and at DACWPF but in differing concentrations. Therefore, if they are identified in low levels in wells at the Lowry Landfill site, it will be impossible to determine whether they are representative of leachate impacts only, impacts from waste-pit liquids, or a combination of the two. Depending

on the trends associated with the results, they could also be indicative of a contaminant front that is just beginning to impact the well. Therefore, this approach cannot even provide a conclusive qualitative assessment of the relative impacts of leachate versus waste-pit liquids.

Section 5.4.2, Page 5-61, Second Full Paragraph:

In this paragraph, the Respondents state that

"Although this approach cannot quantitatively provide an estimate of the contribution of leachate, if any, from the unsaturated solids to shallow groundwater contamination, the chemical quantification of this interaction is not needed for completion of the EA and FS for OUs 2 and 3. Existing qualitative evaluations are, therefore, sufficient at this time."

The Respondents have previously stated that level III data is needed for the FS. The contribution of leachate from unsaturated landfill solids is needed to complete the FS for OUs 1 and 6. Therefore, quantitative data (at least level III) is required. Existing qualitative evaluations are not sufficient. This lack of data constitutes a data need that must be fulfilled as a part of the ASC program for OUs 2 and 3. In addition, it should be noted that this is not a "worst case approach" as stated in the previous paragraph; instead, it is an unrealistic approach that is highly biased in favor of the Respondents.

In this paragraph, the Respondents state that utilizing a statistical approach may be possible to distinguish between the effects of refuse leachate and hazardous waste liquids at the Lowry Landfill site. A report by Dr. Robert D. Gibbons is referenced as verification. If the usefulness of statistics for this purpose has been verified, then the statistical evaluation should be presented as a part of this IDE Report including the results of the study performed by Dr. Gibbons. Unless this information is presented, an evaluation of this conclusion cannot be made. In addition, Dr. Gibbon's report must be made available to members of the TAG.

Section 5.4.3, Page 5-67, First Full Paragraph:

In the second sentence of this paragraph, the Respondents state that

"The results of the one-dimensional analysis provided an unrealistically high estimate of infiltration when considering the semi-arid environment of the Denver area."

If the application of this model results in an unrealistically high estimate of infiltration when considering the semi-arid environment of the Denver area, it should not be used in this analysis. The model used should be appropriate for application to sites in semi-arid environments. The model to be used for estimating infiltration needs to be an event-based model.

In the last part of this paragraph, the Respondents state that

"It is generally accepted practice to obtain input parameters for most available model (i.e., HELP II) from both site-specific and literature sources. No additional site-specific data, except for landfill cap porosity, is anticipated to be necessary to complete subsequent refinements of infiltration volumes for FS purposes."

There are no site-specific data available for evaluation of infiltration volumes. Therefore, this statement implies that all data will come from other sources with the exception of landfill cap porosity data. It is not appropriate to use all literature information for this analysis nor is it appropriate to use the HELP default values. This lack of site-specific data constitutes a data need that must be fulfilled as a part of the ASC program for these OUs.

Section 5.4.4. Page 5-67. Last Paragraph:

The title of this section is "LEACHATE CHARACTERISTICS AND FLUX TO SURFACE WATER, SEDIMENT, AND SOILS", yet the entire section involves a discussion of runoff. Leachate is not equivalent to runoff. The actual occurrence or potential for leachate generation within the refuse to impact surface water, sediment, or soil now or in the future, must be evaluated.

Section 5.4.4.2. Page 5-74. Third Full Paragraph:

This paragraph provides an estimate of runoff from the tire pile area "...assuming average conditions...." This estimate was given on the basis of the wettest year in the last 40 years. It is approximately 2 to 3 times the normal flow in Unnamed Creek. This estimate is conservatively high and, therefore, is not representative of average conditions.

Section 5.4.4.3, Page 5-76, First Full Paragraph:

This paragraph references areal distribution plots for select parameters in surface soil samples that are provided in Figures 5-17 through 5-20. The location (boundaries) of the borrow areas should be shown on these figures because the conclusion is made that cap materials are not contaminated on the basis of the results of soil samples taken from the borrow areas.

Section 5.4.4.3, Page 5-76, Second Full Paragraph:

The first bullet in this paragraph states that

"Data from surface soil samples collected within the cap or borrow areas are indistinguishable from background soil samples collected 1.5 to 2.5 miles east of the site."

This statement is unsubstantiated. A reference must be provided or the data and analysis upon which this conclusion was based must be presented in this report.

Section 5.5.1.1, Page 5-88, Paragraph 1:

This paragraph references work by Millington (1961) and Millington and Quirtz (1962).

These references are not included in the list of references for this report.

Section 5.5.1.2, Page 5-93, First Full Paragraph:

In the first sentence of this paragraph, the Respondents state that

"As noted in EPA Technical Memorandum 21 (EPA, 1989a), the Phase I ambient air monitoring data for volatile organic compounds did not indicate significant emissions of them from the landfill into ambient air."

Yet, the last sentence of this paragraph indicates that an analysis of the Phase I data indicate nonsystematic Tenax-tube contamination or tube mislabeling. This conclusion means the quality of the Phase I ambient air data was not reliable. Therefore, the conclusion that there was a lack of significant emissions from the landfill into ambient air cannot be made on the basis of these data.

Section 5.5.1.3, Page 5-99, Last Paragraph:

In this paragraph, the Respondents state that

"Based on this evaluation, only one well (upgradient well MW-4) was identified that showed potential impacts by gas migration."

The contaminants identified in this well were detected only sporadically and were primarily very low levels of laboratory contaminants. The Lowry Coalition believes that these contaminants are laboratory artifacts. Therefore, the results of this evaluation do not allow a definitive conclusion.

Section 5.5.1.3, Page 100, First Full Paragraph:

In this paragraph, the Respondents state that

"With the knowledge that large quantities of industrial liquid wastes were disposed in waste pits currently located below the water table, the contribution of landfill gas interactions to the noted groundwater contamination are expected to be minor or non-existent."

The Respondents do not present any data to support this conclusion. Therefore, this conclusion is unsubstantiated and cannot be made. The Respondents also state that

"This is due to the disparity in concentrations between groundwater and gas and can therefore not be quantitatively addressed. Because of this, further evaluation of this issue is not warranted."

This statement is also of questionable accuracy. For example, vinyl chloride has been shown to be high in the landfill gas, but usually not detected in the liquids. Vinyl chloride is one of the discriminator compounds used by the Respondents to identify the relative impacts of landfill leachate. No conclusions can be made on the basis of the evaluation presented in this report. Therefore, further evaluation must be conducted.

Section 5.5.1.4, Page 5-102, First Full Paragraph:

In this paragraph, the Respondents indicate that the available data are not sufficient to assess the impacts of landfill gas on adjacent soil and that

"No other data is available to help evaluate potential gas migration from the landfill into adjacent soils."

The Lowry Coalition agrees with this conclusion, identifying a data need that must be fulfilled in the ASC program for these OUs.

Section 5.5.2.1, Page 5-104, First Full Paragraph:

The Respondents state that

"The VOCs appear to be predominantly materials introduced into the landfill during operation and do not represent a biogenesis of VOCs from decomposition of organic materials within the landfill."

This statement is not substantiated by data or facts and is strictly the opinion of the authors. References by Webster and others indicating that volatile organic compounds (VOCs) are biogenerated by refuse decomposition are included as Attachment 1 to these comments.

It should also be noted that the extreme variability in concentration of specific contaminants in landfill leachate makes the use of data from County Line Landfill or the mean values from the Meta Systems report almost meaningless for characterizing the specific contaminant concentrations resulting from refuse leachate at the Lowry Landfill site.

Section 5.5.2.1, Page 5-105, First Full Paragraph:

In this paragraph, McCarty, 1964, is referenced regarding the affects of toxic or inhibitory materials placed in landfills on the biogenesis of landfill gas. It seems likely that much more recent work has been done in this area. The most recent work available should be referenced.

Section 5.5.2.2, Page 5-111, Second Full Paragraph:

In this paragraph, the Respondents reference methane and carbon dioxide as being the two main constituents of landfill gas. In this regard, they state

"As these main constituents are not easily derived from the volatilization of unsaturated solids, sludges, or other liquid materials previously placed in landfill, the effort required to quantify volume of bio-gas generated from these other materials is not justified."

The Respondents do not provide data or references to support this argument. Unless the supporting data are presented, the volume of bio-gas generated from these sources should remain as a data need that must be fulfilled during the ASC program for these OUs.

Section 5.5.2.2, Page 5-111, Third Full Paragraph:

In this paragraph, the Respondents state that

"The general sparsity of organic compounds normally found in semi-arid environments indicate that the bio-gas generation from these soils is negligible and need not be considered further."

Data to support this statement is not presented. A reference supporting this statement must be provided.

Section 5.5.2.2, Page 5-112, First Full Paragraph:

In this paragraph, the Respondents state that

"Bio-gas generation from unsaturated refuse contaminated by waste-pit liquids is expected to be indistinguishable from bio-gas generated by unsaturated uncontaminated refuse."

This statement is unsubstantiated. Data or a supporting reference must be provided.

Section 5.5.2.2, Page 5-112, Fourth Full Paragraph:

In this paragraph, the Respondents state that

"Bio-gas generation from unsaturated solids in the tire pile area contaminated by waste-pit liquids is expected to be indistinguishable from bio-gas generated by unsaturated uncontaminated refuse."

This statement is unsubstantiated. Data or a supporting reference must be provided.

Section 5.5.2.2, Page 5-117, First Full Paragraph:

This paragraph summarizes the evaluation of individual sources of bio-gas. Toxicity of the individual sources of bio-gas generation was not addressed in this evaluation. This is an important consideration for the EA in the characterization of these individual sources.

Section 5.5.2.2, Page 5-117, Second Full Paragraph:

In this paragraph, the Respondents state that

"As any gas remediation system will dramatically alter the current site conditions and render the majority of the current conceptual model invalid. Further data acquisition regarding bio-gas issues is not indicated."

Remediation does not obviate the need for additional data. This IDE Report evaluation and the need for additional data should be based on the current situation as it exists today. This evaluation and any additional data collection are being done in support of the EA and FS for OUs 2 and 3, which will determine the type of remediation to be implemented. Furthermore, the conceptual model should be capable of evaluating changes in site conditions such as bio-gas generation and bio-gas removal resulting from gas remediation alternatives.

Section 6.1.1.1, Page 6-3, First Full Paragraph:

This paragraph indicates that no additional work is proposed to evaluate contaminated soil cover and that this item is being removed from the conceptual model. The results of only two samples are available from the landfill cap. It appears that the results of several samples are available from the borrow area, although an assessment of the exact number of samples and their location within the borrow area cannot be made because the boundaries of the borrow areas are not presented. It is questionable whether the existing data are sufficient to support removal of this item from the conceptual model.

Section 6.1.1.1, Page 6-4, Paragraph 2:

In this paragraph, the Respondents state that a distinction between unsaturated waste-pit solids in the tire pile area and other unsaturated soil is not necessary for the FS because "... potential hot spot removal in the tire pile area will focus on waste pits." The Phase I/II FS Report for the Shallow Groundwater and Subsurface Liquids and Deep Groundwater OUs (OUs 1 and 6) does not address removal of waste pits as potential hot spots. In addition, this conclusion prejudices the selection of a remedy and cannot be made at this time.

Section 6.1.1.2, Page 6-6, First Full Paragraph:

In this paragraph, the Respondents state that

"To date, there has been no evidence of leachate seeps emanating from the unsaturated solids which may impact surface water."

Leachate seeps were identified at the toe of the landfill in the IDE for OUs 1 and 6.

Existing data are not available to determine whether or not these seeps emanate from the unsaturated landfill solids, but this cannot be precluded. Therefore, The Lowry Coalition feels very strongly that this item should not be removed from the conceptual model for OU 2.

Section 6.1.1.2, Page 6-6, Paragraph Continued on Page 6-7:

In this paragraph, the Respondents propose additional work to define aqueous and non-aqueous liquids in waste pits above the water table in the tire pile area. Several borings have been installed in the tire pile, none of which have identified perched liquids. It was concluded in the IDE for OUs 1 and 6 that perched liquids are not present in this area. Therefore, The Lowry Coalition believes that no additional data are required for this item.

Section 6.1.1.2, Page 6-8, Last Paragraph:

In this paragraph, the Respondents state that

"Based on the evaluation of the existing data (see Section 5.4.1), there is no evidence of contamination of cap materials, therefore, the generation of contaminated leachate from the cap is unlikely."

As stated in the comment on Section 6.1.1.1, Page 6-3, First Full Paragraph, the existing data may not be sufficient to evaluate whether or not the cap materials are contaminated. Therefore, this item should be maintained as a separate interaction.

Section 6.1.1.2, Page 6-9, Second Full Paragraph:

In this paragraph, the Respondents propose to remove the interaction regarding leachate migration to surface solid adjacent to or surrounding the landfill mass from the conceptual model. As stated in the comment for page 6-6, leachate seeps were identified at the toe of the landfill in the IDE for OUs 1 and 6. In addition, this item should be retained as an interaction because it could be a future interaction. For example, aging, decomposition, and compaction of the refuse could result in cracks in the landfill surface exposing contaminated materials. Erosion of the cover could also result in the exposure of contaminated materials. These exposed materials could

then contaminate runoff, which could impact surface soil adjacent to the landfill mass. Therefore, this item should not be removed from the conceptual model as an interaction.

Section 6.1.1.2, Page 6-10, Second Full Paragraph:

In this paragraph, the Respondents have proposed to remove leachate migration from the unsaturated landfill solids to unsaturated surface soil in the tire pile area from the conceptual model as an interaction. This interaction should not be removed from the conceptual model for the reasons specified in the previous comment.

Section 6.1.1.2, Page 6-11, Paragraph 1:

This paragraph recommends the removal of leachate migration to surface water and sediment in Unnamed Creek from the conceptual model. As stated in the two previous comments, leachate seeps have been identified along Unnamed Creek both at the toe of the landfill and in the tire pile area. Therefore, this interaction should not be removed from the conceptual model.

Section 6.1.1.3, Page 6-9, Paragraph Continued from Page 6-8:

In this paragraph, the Respondents state that

"It is further noted that WMC and Denver are in the process of constructing a four-foot-thick clay cap over the main landfill area."

As indicated in the previous comment on Section 5.2.1, page 5-8, fourth full paragraph, the cover material is not equivalent to a 4-foot-thick clay cap because of the expansive properties of the material. Depending on the depth of desiccation cracks, this cover material may only provide minimal reduction of infiltration.

Section 6.2.1.3, Page 6-23, Last Paragraph:

In this paragraph, with regard to net gas migration from potential gas sources within the landfill to shallow groundwater, the Respondents state that

"The magnitude of this mass transport process in the future will be drastically decreased with potential remediation proposed."

As stated previously, such statements prejudge the type of remediation to be selected as a result of the FS. These data are being collected to support the EA and FS for OU 3. Such a statement is not appropriate at this time.

Section 6.2.1.3, Page 6-24, Paragraph 2:

In this paragraph, the Respondents state that

"Because the current rate of mass transport from landfill gases into shallow groundwater is small and cannot be measured or calculated, and due to the fact that future rates will be greatly decreased, it is proposed that item M_{1c} be eliminated from the conceptual model."

The conclusions in this statement are unsubstantiated. Supporting data must be provided or this item must remain as a part of the conceptual model.

Section 6.2.1.3, Page 6-25, Paragraph Continued from Page 6-24:

In this paragraph, the Respondents state that

"Because this media interaction will be very small if it exists at all (see above discussion under item M_{1c}) and since it cannot be measured using existing methods, it is proposed that M_{3b} be removed from the conceptual model."

Because this interaction cannot be measured, it does not mean it cannot be evaluated. The lack of site-specific data has not prevented the authors from performing numerous other evaluations. This item should not be removed from the conceptual model.

Section 6.2.1.3, Page 6-25, Second Full Paragraph:

In this paragraph, the Respondents again indicate that an interaction (soil-gas migration from the unsaturated zone in the tire pile area into shallow groundwater) cannot be evaluated because there are no methods to measure this process on a site-specific basis. As stated in the previous comment, an evaluation can and should still be conducted. This item is an important interaction and must not be removed from the conceptual model.

Section 7.1, Page 7-1, Paragraph 1:

This paragraph lists assumptions on which additional data needs for OUs 2 and 3 are based. The first bullet indicates the "No Action" alternative will not be pursued. CERCLA requires that the no-action alternative be carried through the detailed evaluations in the FS. The second bullet indicates that extensive excavation will not be pursued. As stated in The Lowry Coalition's comments on the CWP for OUs 2 and 3, this assumption prejudices a remedy and, therefore, is not consistent with the Superfund Amendments and Reauthorization Act (SARA).

Section 7.1, Page 7-1, Paragraph 2:

In this paragraph, the Respondents state that

"The intent of the assumptions is to focus data collection on completing the EA for OUs 2 and 3, for evaluating remedial alternatives, and for performing treatability studies."

The focus of data collection efforts for these OUs must also consider data needed by other OUs for the assessment of contributions of contamination from media in these OUs to media in other OUs.

Section 7.1, Page 7-2, Paragraph 2:

In this paragraph, the Respondents state that the Lowry Landfill site is a "Type II" landfill, i.e., a landfill having hot spots. EPA has not yet defined the Lowry Landfill site as either a Type I or Type II landfill. The presence of waste pits have been documented at the Lowry Landfill site. However, these waste pits cannot be hydraulically distinguished from the shallow groundwater, and sampling results indicate that not all of these waste pits are contaminated.

Section 7.2.1, Pages 7-4 through 7-11, Table 7-1:

This table provides a summary of additional data needs for landfill solids. This table indicates that data quality objectives (DQOs) have been fulfilled for Hazardous Substance List (HSL) organics. This is not possible because HSL organic data for unsaturated solids is nonexistent and data are not available to confirm the comparability of saturated solids data. This table also indicates that DQOs have been fulfilled and no further data are needed for refuse composi-

tion. The Lowry Coalition disagrees with this conclusion. Site-specific data are not available for refuse composition and data from County Line Landfill site are not comparable as stated in previous comments. Therefore, additional data are needed for this item.

Section 7.2, Pages 7-12, Table 7-2:

Under chemical data for landfill leachate, the Respondents indicate that DQOs have been fulfilled and that no further data are needed. Yet this table also indicates that no data are available for leachate from the unsaturated zone. Site-specific data for leachate from the unsaturated zone must be obtained. The lack of these data constitute a data need that must be fulfilled as a part of the ASC program for OUs 2 and 3.

Section 7.2, Page 7-13 through 7-15, Table 7-3:

This table summarizes the additional data needs for landfill gas. Under Chemical Characteristics of Gas, Phase I ambient air monitoring samples are listed. However, the DQO fulfilled and Additional Data Needs columns are blank. Entries relevant to these data should be provided under both of these columns. This table also indicates that for refuse composition, only literature data and data from a WMC report on a Landfill Gas Recovery Test Program are available. The table indicates that these data fulfill DQOs and that no additional data are needed for refuse composition. The Lowry Coalition disagrees with this conclusion. Data from County Line Landfill are not comparable and data from the landfill gas recovery test program were not presented for evaluation in this report. Therefore, there is a need for additional refuse composition data that must be obtained as a part of the ASC program for these OUs.

Section 7.2.1.1, Page 7-3, Last Paragraph Continued on Page 7-16:

In this paragraph, the Respondents state that

"The areal and vertical extent of the Lowry Landfill solids OU has been adequately defined for purposes of the FS."

The Lowry Coalition agrees with this comment. However, this information, specifically the areal and vertical extent (volume) of the refuse, should be presented as a part of this report.

Section 7.2.1.2, Page 7-16, First Full Paragraph:

In the first bullet in this paragraph, the Respondents state that it is not possible to characterize municipal landfill refuse because of its heterogeneity. If it is not possible to characterize landfill refuse because of its heterogeneity, then how were such data obtained for other landfills? If it was done for other landfills, it can also be done for Lowry Landfill. Site-specific data to characterize the landfill refuse should be obtained.

The second bullet in this paragraph states that

"Installation of additional boreholes in the landfill solids OU to collect unsaturated refuse samples may result in creating possible additional and/or enhanced migration of contaminants."

This is not true. If the boreholes are installed and abandoned properly, enhanced migration will not occur. This should not be a consideration in the collection of additional samples of the unsaturated refuse.

In this last bullet of this paragraph, the Respondents state that

"Characterization of landfill refuse is not necessary because capping is the only practicable remedial action alternative (EPA, 1991a), except for known hot spots which may potentially be remediated by other means."

Any conclusion regarding remediation must be made during the FS. These data are being collected to support selection of remedial alternatives during the FS. Such alternatives should not be prejudged. In addition, these data are needed to assess contribution of contaminants from the refuse to other media. These media interaction data are needed to complete the FS for OUs 1 and 6.

Section 7.2.1.2, Page 7-17, First Full Paragraph:

In this paragraph, regarding chemical characteristics of refuse, solids and waste-pit liquids, the Respondents state that

"Characterization of the solids for these parameters is, therefore, sufficient for purposes of the FS and EA and no additional data needs are required except for insufficient spatial distribution for two waste-pit areas as discussed further below."

The Lowry Coalition strongly disagrees with this statement and the conclusions of this paragraph. As previously stated, no site-specific data exists for unsaturated solids in the landfill area. Therefore, additional data are needed for the landfill area. It should also be noted that the Respondents have not mentioned the dead animal pits. An analysis of data needs for the dead animal pits must also be made as a part of this IDE.

Section 7.2.1.2, Page 7-17, Second Full Paragraph:

With regard to EP toxicity for metals and pesticides and TCLP data, the Respondents state that

"These parameters are only necessary for waste-pit solids that could be practicably removed and disposed in a hazardous waste landfill."

This statement is incorrect. These data will also provide information regarding the contaminant contribution from unsaturated landfill solids to shallow groundwater. These data are needed to complete the FS for OUs 1 and 6.

Section 7.2.1.2, Page 7-18, First Full Paragraph:

In this paragraph, the Respondents state that

"Two areas have not been characterized sufficiently: (1) portions of the tire pile area and (2) the medical waste disposal area in the southeast corner of the main landfill mass."

Portions of the tire pile area needing further characterization should be designated. In addition, because dioxin has been identified in the groundwater and no specific source in the waste pits has been identified, the landfill solids should also be further characterized to assess the presence of dioxin.

Section 7.2.1.3, Page 7-18, Third Full Paragraph:

This paragraph lists physical parameters that have not been characterized for the landfill solids. Compressibility/compaction data should be added to this list. The Respondents state that literature data for many of these parameters are sufficient for the FS and EA purposes. The method of obtaining data for the remaining parameters must be specified.

The last sentence of this paragraph states that

"Due to the extreme heterogeneity of landfill refuse, a large, impracticable, and cost-prohibitive number of measurements would be required for complete characterization."

The basis for this conclusion must be presented as a part of this report. In addition, in at least some cases, a partial characterization of the unsaturated landfill solids would be adequate for purposes of the EA and FS and would be more appropriate than literature data.

Section 7.2.1.3, Page 7-19, Paragraph 2:

The first sentence of this paragraph states that

"According to the AO and CWP for OUs 2 and 3, the waste pits located above the water table are the focus of the landfill solids OU investigation."

This statement is only true if these waste pits are no longer saturated. All saturated waste pits are included within OU 1 even if they occur above the water table.

The Respondents also state in this paragraph that

"The primary EA concern for waste pits within the unsaturated refuse is the potential for waste-pit liquids to migrate to shallow groundwater."

Leachate from waste-pit solids in the unsaturated zone as a result of infiltration and refuse decomposition is also a concern for the EA. For example, if it is assumed that there are approximately 200 acres of refuse with an average depth of 40 feet and an average moisture content of 50 percent, even if only 10 percent of the moisture is released, the total volume of resulting leachate would be a minimum of 130 million gallons.

Section 7.2.1.3, Page 7-19, Last Paragraph:

In this paragraph, the Respondents state that

"...the quality and quantity of any additional leachate derived from percolation through unsaturated zone waste-pit solids will probably be insignificant to any EA evaluations."

The data supporting this statement are not presented in this report and such data does not currently exist. Therefore, this statement is highly speculative. This conclusion cannot be made unless it is supported by an appropriate analysis on the basis of site-specific data.

Section 7.2.2.1, Page 7-20, Last Paragraph Continued on Page 7-21:

The second sentence in this paragraph states that

"The Lowry Landfill is located in a semi-arid environmental and, therefore, the generation of a large volume of leachate is not expected."

This statement assumes all leachate is the result of infiltration. Landfill refuse also contains liquids when disposed. These liquids are later released as a result of decomposition and become part of the landfill leachate. However, the leachate volume from infiltration will also be large. If infiltration is only 1 inch per year, the volume of leachate generated per year over a 200 acre site would be approximately 5.4 million gallons. Even if only 10 percent of the normal infiltration occurs, the total volume of leachate generated over a 30 year period would amount to 16 million gallons.

The Respondents also state in this paragraph that the conclusion that large quantities of leachate are not being generated is supported

"...by an evaluation of existing boring logs through fill materials showing no evidence of significant quantities of leachate within the unsaturated solids (see Section 5.4.1). The main factor contributing to leachate quantity generated within the unsaturated zone is infiltration."

These conclusions are not true. The lack of leachate within the landfill may result because any leachate that is generated is not retained, but migrates vertically or laterally and becomes incorporated with other subsurface liquids. In addition, leachate generated as a result of retained liquids and the moisture content of the refuse can contribute a sizeable percentage of the total leachate. This is especially true in semi-arid environments such as that of the Lowry Landfill site where infiltration is minimal.

Finally, the Respondents state that

"The main factor contributing to leachate quantity generated within the unsaturated zone is infiltration."

This statement is also inaccurate. As shown using the analysis presented in the comment for page 7-19, the total leachate generated from moisture retained within the refuse could be well over 130 million gallons, while leachate generated over a 30 year period from infiltration would only be 16 million gallons.

Section 7.2.2.1, Page 7-21, Second Full Paragraph:

In this paragraph, the Respondents state that

"The data is sufficient for purposes of preparing a water balance and additional characterization of soil types is not identified as and additional data need."

Most of the soil at the Lowry Landfill site have been disturbed. Therefore, existing Soil Conservation Service data on soil in the area of the site are not adequate to provide the site-specific soil characteristics needed for preparing a water balance.

Section 7.2.2.2, Page 7-21, Third Full Paragraph:

In this paragraph, the Respondents state that

"...it does not appear likely that large quantities of leachate will be generated in the future from the unsaturated landfill solids."

The Lowry Coalition strongly disagrees with this conclusion for the reasons stated in the previous comments. It should be noted that the release of moisture retained within the refuse must be considered as a part of any water balance calculations used to generate leachate volumes.

Section 7.2.2.2, Page 7-22, Last Paragraph Continued on Page 7-23:

In this paragraph, the Respondents state that

"Since most former waste pits are presently below the water table, shallow groundwater is commingled with waste-pit liquids."

This statement should indicate that other subsurface liquids such as refuse leachate are also combined with the shallow groundwater.

The last sentence of this paragraph states that

"...leachate associated with residual contamination of unsaturated landfill solids with former waste-pit liquids will provide additional degradation of groundwater quality."

Leachate from the unsaturated landfill solids not associated with former waste pits will also add to the degradation of the groundwater.

Section 7.2.2.2, Page 7-23, First Full Paragraph:

In this paragraph, the Respondents state that

"...existing chemical data from shallow groundwater wells are sufficient to help evaluate potential chemical characteristics of leachate from the unsaturated solids with respect to FS and EA purposes."

The Respondents did not provide any supporting data to indicate that the chemical characteristics of the shallow groundwater are representative of the chemical characteristics of leachate from the unsaturated landfill solids. Therefore, this statement is a conjecture. Because no data exists for leachate, the available data are not adequate to support the FS and EA.

Section 7.3.1, Page 7-26, Paragraph 3:

This paragraph indicates that a total of five borings are proposed for collection of additional samples from the unsaturated landfill solids. This number of borings is insufficient. Additional borings are also needed in the landfill area. In addition, according to the IDE for OUs 1 and 6, some of the waste pits in which borings are proposed to be installed are actually former borrow areas not waste pits. The Respondents must provide a justification for the selected boring locations and distribution.

Section 7.3.2, Page 7-32, First Full Paragraph:

This section describes the additional work to be completed for characterization of the unsaturated landfill solids leachate. As stated in comments throughout this document, site-specific data for leachate from the landfill area must also be obtained. In addition, County Line Landfill is not comparable to Lowry Landfill. Therefore, data from leachate at County Line

Landfill are not sufficient to fulfill the data needs for leachate from the landfill area at Lowry Landfill.

Section 7.3.2.1, Page 7-32, Third Full Paragraph:

This section addresses samples to be collected to evaluate the porosity of the clay cap. Only two samples are designated for this purpose. Because of the large areal extent of the cap, this number seems to be very low. This paragraph also references the "...landfill cap in the vicinity of the tire pile area." No cap currently exists in the vicinity of the tire pile area.

Section 7.3.2.3, Page 7-33, First Full Paragraph:

This section addresses samples to be collected from borings around the perimeter of the landfill for evaluation of migration of leachate from the landfill. Only one sample per boring is proposed. Justification of the collection of only one sample per boring should be provided. This approach discounts any variation with depth.

Section 7.3.3.1, Page 7-35, First Full Paragraph:

In this paragraph, the Respondents state that

"A significant effort will be required to determine whether soil gas concentrations are due to underlying groundwater contamination or to gas migration associated with potentially contaminated soil adjacent to the landfill."

The Respondents previously stated that it was impossible to differentiate between landfill gas and gas generated from groundwater contamination. The Respondents must indicate how such a differentiation will be made for this ASC.

Section 7.3.3.4, Page 7-36, Last Paragraph:

In this paragraph, regarding the proposed method of monitoring for radionuclide-containing compounds or radon, the Respondents state that

"This practice will result in a greater sensitivity to the potential presence of these substances, resulting in a conservative (biased towards protection of the environment) approach."

It is difficult to comprehend how an approach utilizing an indirect method of measurement can result in a "greater sensitivity" and "greater protection of the environment". This inconsistency must be clarified.

Section 8.0, Page 8-1, Paragraph 2:

This paragraph provides justifications for performing a combined RI/FS for OUs 2 and 3 rather than separate RI/FSs. Any decision to combine the RI/FS for these OUs must consider whether the remedies for the OUs may also be combined.

Section 9.0, Page 9-2, Second Full Paragraph:

The third sentence in this paragraph states that

"The review oversight resulted in grouping the data into usability categories ranging from fully usable for project purposes through usable."

This sentence does not make sense. Clarification should be provided.

Section 9.0, Page 9-3, Paragraph 4:

The last sentence of this paragraph states that

"Since field screening and detailed visual observations were being noted, it was concluded that no significant evidence of contamination was noted to merit subsequent chemical analysis."

As previously stated in the comment for Section 5.3.1.1, Page 5-26, visual observations are not sufficient to conclude that contamination does not exist. Such a conclusion must be supported by site-specific sampling data.

Section 9.0, Page 9-4, First Full Paragraph:

In this paragraph, the Respondents indicate that no leachate data are available. The Respondents then conclude that leachate data are not available because no leachate was encountered during drilling. Leachate data are not available because the leachate moves through the landfill solids under unsaturated condition. Leachate data could be obtained from TCLP results for unsaturated refuse samples.

Section 9.0, Page 9-4, Second Full Paragraph:

In this paragraph, the Respondents state that leachate flux to shallow groundwater is a concern. The Respondents then go on to provide a qualitative comparison of leachate composition using data from County Line Landfill and DACWPF. This qualitative comparison addresses only leachate composition not leachate flux. A discussion of leachate flux must also be provided.

Section 9.0, Page 9-5, Paragraph Continued from Page 9-4:

In this paragraph, the Respondents state that

"Since the main focus of the FS and EA activities will be associated with the migration, fate, and transport of former waste-pit liquids rather than generic landfill leachate, the qualitative evaluation of the areal extent of impact is considered adequate for project purposes."

This statement is incorrect. The purposes of the FS and EA are not to track specific media. The FS and EA are based on the migration, fate, and transport of the specific contaminants present within all relevant media and the concentration of these contaminants at receptor locations.

Therefore, the contribution of contamination from all media is important to the FS and EA.

Therefore, it is necessary to know the areal extent and chemical composition of each medium to assess its contaminant contribution.

Section 9.0, Page 9-5, First Full Paragraph:

In this paragraph, the Respondents state that

"The need for more detailed infiltration or water balance modeling was identified; however, no additional field data needs are apparent."

The use of literature values and data from other sites are not appropriate for use in a water balance for the Lowry Landfill site. Because the available infiltration data are not usable, a water balance cannot be performed without additional site-specific data. Additional site-specific data must be collected during the ASC program for these OUs.

Section 9.0, Page 9-6, Last Paragraph:

This paragraph summarizes the additional data needs that were identified for OUs 2 and 3. The Lowry Coalition reiterates that there is also a need for additional characterization of the unsaturated landfill solids and landfill leachate.

Section 10.0:

The following references should have been included in their entirety as appendixes to this report in order to allow a thorough evaluation by reviewers:

- Gibbons, 1989
- Waste Management of Colorado, Inc., 1987
- Waste Management of Colorado, Inc., 1985-1989
- Waste Management of Colorado, Inc., 1983-1988 (County Line Landfill Data)
- Waste Management of Colorado, Inc., 1983-1988 (DACWPF data)

FAX TRANSMITTAL

TO: MARC HERMAN

FAX NUMBER: 293-1238

FROM: Gayle Hegele
Citizens Against Lowry Landfill

DATE: May 17, 1991

RE: IDE COMMENTS OUs 2 & 3



Attached is a first cut of comments developed by Scott Mefford, CALL's technical advisor on the review of the IDE for Ous 2 & 3. We will provide additional detail and explanation within the 30 day comment period, but in light of our desire to have EPA consider our comments when commenting themselves, this first "look" is provided.

Call me if you have any questions.

There are 11 pages counting this cover page. Thank you for your assistance.

Gayle

REVIEW OF INITIAL DATA EVALUATION REPORT -- OU'S 2 AND 3

Pg. 1-1 Which OU is strictly responsible for landfill solids found in waste pits below the water table?

Patty

PG. 3-2 The target compounds chosen for data quality review were selected on the basis of frequency, highest concentrations, toxicity, and mobility. It would seem that the most frequently found compounds, and those identified in the highest concentrations, are not the ones most likely to suffer from QC problems. More problematic materials (like vinyl chloride, cadmium, and radionuclides) found less frequently, or at lower concentrations, yet bearing significant toxicity, may benefit from quality control review.

Rick

Chapter 4 .. One of the identified uses of the collected data will be the development of a HELP II model of the site. It would be useful to know specifically what data is required for input into this model, and what parameters are most sensitive in effectively utilizing the code. This may want to be considered in assessing data quality objectives.

Rich

PG. 5-13 This page indicates that evaporation is an important factor in assessing infiltration. However, on page 5-12, the meteorological data being collected does not include pan evaporation. How will evaporation be calculated from the collected data? An evaporation pan should be considered for inclusion in the meteorological monitoring.

Rich

PG. 5-26 The last sentence from the first paragraph states "If contamination was suspected (in refuse), either from visual inspection or field instrument monitoring, it is expected that samples would have been collected and analyzed from the unsaturated zone. " Is this being interpreted to mean that none of the boreholes drilled during Phase I and II by CH2M-Hill encountered contamination in unsaturated refuse? What was the objective of the CH2M-Hill drilling during Phase I and 2, and how was the sampling conducted? Is this negative premise supported by any field data?

See EPA

PG. 5-27 Why are there no radionuclides included in Table 5-3?

Rich
Frank

PG. 5-35 Referencing Table 5-6 "Mean Concentration in Western United States of Selected Metals".. While the natural concentration of many metals are significant, the comparison of site data to such generic information as contained on this table seems of little value.

See EPA

Background metal concentrations will vary significantly from site to site depending upon the mineralogy of the parent material from which the soils were derived, and various other transport, hydrologic, and chemical parameters. Appropriate background values for the Lowry site should be developed from actual background sampling in the area.

PG. 5-37 Radionuclides are identified in this list of analytes of concern by gross alpha and gross beta emissions, or as Radium-226. Some further breakdown, or at least discussion, of the identified radioisotopes and their associated concentrations and half-lives would be beneficial in assessing remediation.

Fank

PG. 5-36-37 Tables 5-7 and 5-8 lists "Preliminary Compounds of Concern in Solid Samples". We recommend that all analytes detected on-site, and delineated in the Colorado Basic Standards for Ground Water, (as amended) be considered for inclusion in the Compounds of Concern, at least for the preliminary listing depicted here. Some analytes with relatively high toxicity were left off the list because they apparently just missed the 10% frequency of detection threshold. Cadmium is a good example of an analyte that is highly toxic, relatively mobile and highly regulated, yet which was left off the list because it was detected with an 8% frequency.

Rick

PG. 5-47 The three bullets on this page suggest a strong

correlation between contaminate groups and the waste pits. This seems contrary to some of the OU 1 and 6 findings which describe contamination in the shallow ground water as being much less localized. OU 1 and 6 seem to suggest that shallow contamination is less focused on the waste pits, and is more disseminated with a relatively poor distinction between concentrations of contaminates found in the pits and concentrations found outside the pits. How does the OU 2 and 3 conclusion fit with the OU 1 and 6 conceptual model?

Rick

PG. 5-41 to 5-46 These maps depict locations used to collect data on sub-surface solids. Apparently no sub-surface solids samples were collected in the oil sludge area on the east boundary of the study area. While surface soil samples did pick up compounds of concern in this area, no sub-surface sampling was conducted or is apparently proposed. This should be considered.

Rick
Frank

PG. 5-55 It is unclear what the author deems to be a "significant quantity of perched leachate" to be. This should be more specific.

Rich

PG. 5-61 The discussion presented in section 5.4.2 relative to separation of landfill and waste pit sources is interesting, and not without merit. However, it seems that actual lysimeter sampling in the unsaturated zone

Rich

would produce more useful and convincing data. It also seems that such site-specific data would be necessary for the EA and FS. Existing qualitative evaluations may NOT be sufficient for purposes of the EA and FS as suggested.

PG. 5-61 If the statistical studies of Dr. Gibbons are to be referenced and utilized, this analysis should be provided in full. It may be that "contaminant sources are differentiable", but the statements provided are not convincing.

Rich

PG. 5-61 thru 5-67 These pages describe how an attempt was made to calculate leachate flux through the unsaturated solids using the Green and Ampt equation. Although the texts concludes the attempt to use this equation was apparently unsuccessful, neither the equation, the calculation procedure, the data utilized, nor the results are presented. Since the Green and Ampt equation is noted, it would be helpful to anyone trying to independently assess the suitability of this procedure if the calculations were appropriately documented.

Rich

PG. 5-85 and 5-86 .. Is there any reason why concentrations of vinyl chloride and methyl chloride at site WP1 are significantly higher in refuse than in waste pit gas samples? How is this resolved in the conceptual model?

Kerfoot

good question

PG. 5-88 The equation presenting the derivation of diffusivity, and the following paragraph explaining this derivation apparently need work. The subscripts appear incorrect and some punctuation seems to be missing in this paragraph. It needs to be re-written so it can be correctly interpreted and understood.

Kerfoot

PG. 5-88 What data is being utilized to conclude that the porosity is .5, or that the ranges for gas filled and water filled porosity are 0.1 to 0.4?

Kerfoot

PG. 5-90 This page concludes the sum of $G(1)$, $G(4)$, $G(8)$, and $G(15)$ may be estimated only within three orders of magnitude. What effect could this relatively large uncertainty have on the evaluation of remedial alternatives, and other assessments in the EA and FS? What field work, if any, could be conducted to refine this estimate of emission rate?

Kerfoot

PG. 5-108 thru 5-117 If OU 1 and 6 are remediated in part by employing enhanced in-situ bioremediation (and subsequent gas generation), how would this impact the discussion of bio-gasses in this IDE. Will the potential for use of such procedures in OU's 1 and 6 be considered in the evaluation of remedial alternatives for OU's 2 and 3?

Kerfoot

PG. 6-3 Is "contaminated soil cover" as it is utilized in this context referring only to the cap material, or also to daily cover buried at depth in the landfill?

Rick
Frank

PG. 6-3 The last paragraph addresses item 4, "unsaturated refuse contaminated by waste pit liquids". The justification for combining this medium with other landfill solids is "there is no evidence for large quantities of perched leachate present within the landfill mass". However, if leachate were actually perched, it is presumed that it would exist in a saturated rather than unsaturated state. (A perched zone would presumably be a saturated zone "perched" above the water table by some low permeability layer.) Consequently, perched conditions are not the point here. Hot spots which may result from the retention of waste pit liquids in unsaturated refuse are the apparent concern. The IDE suggests that 20 to 80 % of the porosity of the refuse may be fluid filled in the unsaturated zone.

Rick

PG. 6-4 There is a similar concern with media 6 as with media 4, discussed above. The IDE concludes that the EA "will consider the net migration of contaminants from combined sources and not focus on individual sources". However, for purposes of examining remedial alternatives, it seems that it would be important to know something about the

Patty
Rick
Rick

distribution and intensity of significant individual contaminant sources.

PG. 6-9 Paragraph 3 addresses interaction item L(3).. Will the potential for leachate generation from the waste oil sludge area and sprayback areas be addressed in this these OU's or in the subsequent soil OU's? If they are addressed in OU's 1 and 2, it seems they should be addressed in interaction L(3).

Rich

PG. 7-16 Bullet 3 states that "Capping is the only practicable remedial action alternative, except for known hot spots which may potentially be remediated by other means." This makes the identification of hot spots significant in the study, and reinforces the need to maintain media 4 and 6 in the conceptual model.

Patty
Rick
Rich

PG. 7-16 The last paragraph states "Liquids initially disposed of in the waste pits are, most probably, no longer present in the unsaturated zone." While saturated conditions or perched liquids may not be frequently encountered, waste pit liquids will be held at less than saturated conditions through specific retention mechanisms. This should not be ignored.

Rich
Rick

Page 7-17 The first paragraph concludes that it is not necessary to further investigate deeply buried waste pits because

Patty
Rick
Rich